

## CLAIMS

1. An adhesive composition, which comprises:
  - (a) an isocyanate-functional prepolymer formed by reacting a polyisocyanate with an alcohol, where the isocyanate equivalents from the polyisocyanate exceeds the hydroxyl equivalents from the alcohol; and
  - (b) an aqueous polymer emulsion.
2. The adhesive composition of claim 1, wherein said alcohol is selected from one or more of acrylates, esters, vinyls, castor oils, or polymers, containing active alcohol groups.
3. The adhesive composition of claim 2, wherein said alcohol is selected from one or more of aliphatic and aromatic polyether polyols optionally alkylated, or caprolactone-based polyols.
4. The adhesive composition of claim 3, wherein said active hydrogen group component is a block polyethylene or polypropylene oxide homo- or copolymer ranging in molecular weight from about 300 to about 3,000.
5. The adhesive composition of claim 1, wherein said isocyanate-terminated prepolymer is made from an isocyanate component selected from hexamethylene diisocyanate, toluene diisocyanate (TDI), diphenylmethane diisocyanate (MDI), m- and p-phenylene diisocyanates, bitolyene diisocyanate, cyclohexane diisocyanate (CHDI), bis-(isocyanatomethyl) cyclohexane (H<sub>6</sub>XDI), dicyclohexylmethane diisocyanate (H<sub>12</sub>MDI), dimer acid diisocyanate (DDI), trimethyl hexamethylene diisocyanate, lysine diisocyanate and its methyl ester, isophorone diisocyanate, methyl cyclohexane diisocyanate, 1,5-naphthalene diisocyanate, xylylene and xylene diisocyanate and methyl derivatives thereof, polymethylene polyphenyl isocyanates, chlorophenylene-2,4-diisocyanate, polyphenylene diisocyanates, isophorone diisocyanate (IPDI), hydrogenated methylene diphenyl isocyanate (HMDI), tetramethyl xylene diisocyanate (TMXDI), hexamethylene diisocyanate (HDI), or oligomers thereof, and mixtures thereof.

6. The adhesive composition of claim 1, wherein said isocyanate prepolymer contains a defoamer and an inhibitor.
- 5 7. The adhesive composition of claim 1, wherein the weight ratio of said isocyanate-functional prepolymer to said aqueous polymer emulsion ranges from about 95/5 to about 60/40.
8. The adhesive composition of claim 7, wherein the weight ratio of said  
10 isocyanate-functional prepolymer to said aqueous polymer emulsion ranges from about 90/10 to about 70/30.
9. The adhesive composition of claim 1, wherein said aqueous polymer emulsion is one or more of acrylic emulsions, vinyl emulsions, styrene-butadiene  
15 polymeric emulsion latices, polyvinyl alcohol emulsions, polyurethane dispersions, polyvinyl acetate-ethylene copolymer emulsions, or carboxylated acrylic latexes.
10. The adhesive composition of claim 9, wherein said aqueous polymer emulsion  
20 is heat curable or radio frequency curable.
11. A laminated wood product adhesively joined with the cured residue of an adhesive, which comprises:  
25 (a) an isocyanate-functional prepolymer formed by reacting a polyisocyanate with an alcohol, where the isocyanate equivalents from the polyisocyanate exceeds the hydroxyl equivalents from the alcohol; and  
(b) an aqueous polymer emulsion., the weight ratio of (a) to (b) ranging from about 95/5 to about 60/40.  
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12. The laminated wood product of claim 11, wherein said adhesive has been cured by heat or radio frequency (RF) curing.

13. The laminated wood product of claim 11, wherein said alcohol is selected from one or more of acrylates, esters, vinyls, castor oils, or polymers, containing active alcohol groups.
- 5 14. The laminated wood product of claim 13, wherein said alcohol is selected from one or more of aliphatic and aromatic polyether polyols optionally alkylated, or caprolactone-based polyols.
- 10 15. The laminated wood product of claim 14, wherein said alcohol is a block polyethylene or polypropylene oxide homo- or co-polymer ranging in molecular weight from about 300 to about 3,000.
- 15 16. The laminated wood product of claim 11, wherein said isocyanate-terminated prepolymer is made from an isocyanate component selected from hexamethylene diisocyanate, toluene diisocyanate (TDI), diphenylmethane diisocyanate (MDI), m- and p-phenylene diisocyanates, bitolylene diisocyanate, cyclohexane diisocyanate (CHDI), bis-(isocyanatomethyl) cyclohexane ( $H_6XDI$ ), dicyclohexylmethane diisocyanate ( $H_{12}MDI$ ), dimer acid diisocyanate (DDI), trimethyl hexamethylene diisocyanate, lysine diisocyanate and its methyl ester, isophorone diisocyanate, methyl cyclohexane diisocyanate, 1,5-napthalene diisocyanate, xylylene and xylene diisocyanate and methyl derivatives thereof, polymethylene polyphenyl isocyanates, chlorophenylene-2,4-diisocyanate, polyphenylene diisocyanates, isophorone diisocyanate (IPDI), hydrogenated methylene diphenyl isocyanate (HMDI), 20 tetramethyl xylene diisocyanate (TMXDI), hexamethylene diisocyanate (HDI), 25 or oligomers thereof, and mixtures thereof.
17. The laminated wood product of claim 11, wherein said isocyanate prepolymer contains a defoamer and an inhibitor.
- 30 18. The laminated wood product of claim 11, wherein the weight ratio of said isocyanate-functional prepolymer to said aqueous polymer emulsion ranges from about 90/10 to about 70/30.

19. The laminated wood product of claim 11, wherein said aqueous polymer emulsion is one or more of acrylic emulsions, vinyl emulsions, styrene-butadiene polymeric emulsion latices, polyvinyl alcohol emulsions, polyurethane dispersions, polyvinyl acetate-ethylene copolymer emulsions, or carboxylated acrylic latexes.
20. The laminated wood product of claim 11, wherein the wood to be joined has a moisture content of less than about 10% by weight.
21. Method for joining together two surfaces of wood products having a moisture content of less than about 10% by weight by application of an aqueous adhesive thereto, which comprises the steps of:
- (a) misting the wood product surfaces to be joined with water;
  - (b) applying to said aqueous adhesive composition to said misted wood product surfaces; and
  - (c) curing said adhesive composition.
22. The method of claim 21, wherein said aqueous adhesive composition is applied to said misted wood product surfaces within about 5 minutes after said misting.
23. The method of claim 21, wherein said surfaces are misted to saturation.
24. The method of claim 21, wherein said adhesive composition comprises:
- (a) an isocyanate-functional prepolymer formed by reacting a polyisocyanate with an alcohol, where the isocyanate equivalents from the polyisocyanate exceeds the hydroxyl equivalents from the alcohol; and
  - (b) an aqueous polymer emulsion, the weight ratio of (a) to (b) ranging from about 95/5 to about 60/40.
25. The method of claim 21, wherein said adhesive has been cured by heat or radio frequency (RF) curing.

26. The method of claim 24, wherein said alcohol is selected from one or more of acrylates, esters, vinyls, castor oils, or polymers, containing active alcohol groups.
- 5 27. The method of claim 26, wherein said alcohol is selected from one or more of aliphatic and aromatic polyether polyols optionally alkylated, or caprolactone-based polyols.
- 10 28. The method of claim 27, wherein said alcohol is a block polyethylene or polypropylene oxide homo- or co-polymer ranging in molecular weight from about 300 to about 3,000.
- 15 29. The method of claim 24, wherein said isocyanate-terminated prepolymer is made from an isocyanate component selected from hexamethylene diisocyanate, toluene diisocyanate (TDI), diphenylmethane diisocyanate (MDI), m- and p-phenylene diisocyanates, bitolylene diisocyanate, cyclohexane diisocyanate (CHDI), bis-(isocyanatomethyl) cyclohexane ( $H_6XDI$ ), dicyclohexylmethane diisocyanate ( $H_{12}MDI$ ), dimer acid diisocyanate (DDI), trimethyl hexamethylene diisocyanate, lysine diisocyanate and its methyl ester, isophorone diisocyanate, methyl cyclohexane diisocyanate, 1,5-naphthalene diisocyanate, xylene and xylene diisocyanate and methyl derivatives thereof, polymethylene polyphenyl isocyanates, chlorophenylene-2,4-diisocyanate, polyphenylene diisocyanates, isophorone diisocyanate (IPDI), hydrogenated methylene diphenyl isocyanate (HMDI), tetramethyl xylene diisocyanate (TMXDI), hexamethylene diisocyanate (HDI), or oligomers thereof, and mixtures thereof.
- 20 30. The method of claim 24, wherein said isocyanate prepolymer contains a defoamer and an inhibitor.
- 25 31. The method of claim 24, wherein the weight ratio of said isocyanate-functional prepolymer to said aqueous polymer emulsion ranges from about 90/10 to about 70/30.
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- 5 32. The method of claim 24, wherein said aqueous polymer emulsion is one or more of acrylic emulsions, vinyl emulsions, styrene-butadiene polymeric emulsion latices, polyvinyl alcohol emulsions, polyurethane dispersions, polyvinyl acetate-ethylene copolymer emulsions, or carboxylated acrylic latexes.
- 10 33. A method for adhesively joining wood product surfaces, which comprises:  
(1) providing an adhesive composition comprising:  
(a) an isocyanate-functional prepolymer formed by reacting a polyisocyanate with an alcohol, where the isocyanate equivalents from the polyisocyanate exceeds the hydroxyl equivalents from the alcohol; and  
(b) an aqueous polymer emulsion.  
(2) applying to said aqueous adhesive composition to said wood product surfaces; and  
15 (3) curing said adhesive composition,
- 20 34. The adhesive composition of claim 33, wherein said alcohol is selected from one or more of acrylates, esters, vinyls, castor oils, or polymers, containing active alcohol groups.
- 25 35. The adhesive composition of claim 34, wherein said alcohol is selected from one or more of aliphatic and aromatic polyether polyols optionally alkylated, or caprolactone-based polyols.
- 30 36. The adhesive composition of claim 35, wherein said active hydrogen group component is a block polyethylene or polypropylene oxide homo- or co-polymer ranging in molecular weight from about 300 to about 3,000.
37. The adhesive composition of claim 33, wherein said isocyanate-terminated prepolymer is made from an isocyanate component selected from hexamethylene diisocyanate, toluene diisocyanate (TDI), diphenylmethane diisocyanate (MDI), m- and p-phenylene diisocyanates, bitolylene

5 diisocyanate, cyclohexane diisocyanate (CHDI), bis-(isocyanatomethyl)  
cyclohexane ( $H_6$ XDI), dicyclohexylmethane diisocyanate ( $H_{12}$ MDI), dimer acid  
diisocyanate (DDI), trimethyl hexamethylene diisocyanate, lysine diisocyanate  
and its methyl ester, isophorone diisocyanate, methyl cyclohexane  
diisocyanate, 1,5-naphthalene diisocyanate, xylylene and xylene diisocyanate  
and methyl derivatives thereof, polymethylene polyphenyl isocyanates,  
chlorophenylene-2,4-diisocyanate, polyphenylene diisocyanates, isophorone  
diisocyanate (IPDI), hydrogenated methylene diphenyl isocyanate (HMDI),  
tetramethyl xylene diisocyanate (TMXDI), hexamethylene diisocyanate (HDI),  
10 or oligomers thereof, and mixtures thereof.

38. The adhesive composition of claim 33, wherein said isocyanate prepolymer  
contains a defoamer and an inhibitor.
- 15 39. The adhesive composition of claim 33, wherein the weight ratio of said  
isocyanate-functional prepolymer to said aqueous polymer emulsion ranges  
from about 95/5 to about 60/40.
- 20 40. The adhesive composition of claim 39, wherein the weight ratio of said  
isocyanate-functional prepolymer to said aqueous polymer emulsion ranges  
from about 90/10 to about 70/30.
- 25 41. The adhesive composition of claim 33, wherein said aqueous polymer  
emulsion is one or more of acrylic emulsions, vinyl emulsions, styrene-  
butadiene polymeric emulsion latices, polyvinyl alcohol emulsions,  
polyurethane dispersions, polyvinyl acetate-ethylene copolymer emulsions, or  
carboxylated acrylic latexes.
- 30 42. The adhesive composition of claim 41, wherein said curing is by heat curing or  
radio frequency curing.